

# Contents

## Part I Economic Gene Mapping in China by Electricity Economics

<b>1</b>	<b>China's Electricity Economy . . . . .</b>	<b>3</b>
1.1	Electricity Economics . . . . .	4
1.1.1	The Characteristics of Electricity Data . . . . .	4
1.1.2	Production Functions with Electricity . . . . .	7
1.1.3	Stages of Economic Development in Terms of Electricity Consumption . . . . .	10
1.1.4	The Characteristics of Gene in an Economy . . . . .	12
1.2	Review of the Economic Development in China by Electricity Economics . . . . .	15
1.2.1	Economic Activities of Three Industries . . . . .	16
1.2.2	National Economic Development . . . . .	29
1.2.3	Stages of Economic Development in China . . . . .	34
1.3	Review of China's Economy in Global Crisis . . . . .	38
1.3.1	Electricity Growths of Secondary and Tertiary Industries . . . . .	39
1.3.2	Electricity Growths for Some Sectors . . . . .	40
1.3.3	Electricity Growth Trends . . . . .	42
1.3.4	Employment Analysis . . . . .	46
	References . . . . .	47
<b>2</b>	<b>Challenge-Opportunity and Mutations in China's Economy . . .</b>	<b>49</b>
2.1	Review of Electricity and Energy Supply in China . . . . .	50
2.1.1	Electric Power Supply . . . . .	50
2.1.2	Coal Production and Consumption . . . . .	56
2.1.3	Oil Production and Consumption . . . . .	62
2.1.4	Natural Gas Production and Consumption . . . . .	64

2.1.5	Hydro-, Nuclear, and Wind Power Production and Consumption . . . . .	66
2.1.6	Total Energy Production and Consumption . . . . .	66
2.2	Emissions . . . . .	71
2.2.1	Air Pollutions . . . . .	71
2.2.2	Water Pollutions . . . . .	73
2.2.3	People's Health Problems . . . . .	73
2.3	Economic Mutation . . . . .	78
2.3.1	Mutations of the Economy in the USA . . . . .	79
2.3.2	Mutations of the Economy in Japan . . . . .	82
2.3.3	Mutations of the Economy in China . . . . .	87
2.4	Findings . . . . .	88
	References . . . . .	89
<b>3</b>	<b>Economic Gene Mapping of China . . . . .</b>	<b>91</b>
3.1	Gene Mapping of an Economy . . . . .	92
3.1.1	Economic Gene Mapping . . . . .	92
3.1.2	Economic Gene Maps of the USA . . . . .	93
3.1.3	Economic Gene Maps of Japan . . . . .	94
3.2	Economic Simulation in China (BAU Scenario) . . . . .	95
3.2.1	Production Growths of 42 Sectors . . . . .	98
3.2.2	Value-Added Growths of Three Industries . . . . .	105
3.2.3	Energy Demand and Supply . . . . .	106
3.3	Economic Simulation of Fiscal and Monetary Policy (Policy Scenario) . . . . .	108
3.3.1	Production Growths of 42 Sectors . . . . .	109
3.3.2	Value-Added Growths of Three Industries . . . . .	116
3.3.3	Energy Demand and Supply . . . . .	118
3.4	Economic Gene Mapping of China . . . . .	120
3.4.1	Economic Gene Maps of China's National Economy . . . . .	120
3.4.2	Economic Gene Maps for Three Industries . . . . .	123
3.4.3	Economic Gene Maps for Sectors . . . . .	127
3.5	Comparison of Gene Maps of China and Japan . . . . .	131
3.5.1	Economic Development Stage . . . . .	133
3.5.2	A Negative Mutation in the Economic Stage . . . . .	134
3.5.3	Similarities and Differences of Gene Maps of China and Japan . . . . .	137
3.6	Findings . . . . .	138
	References . . . . .	140
 <b>Part II Methodology of Agent Response Equilibrium</b>		
<b>4</b>	<b>Review of Economic Modeling . . . . .</b>	<b>143</b>
4.1	Economic Activities . . . . .	143
4.2	Input–Output Table . . . . .	145

4.3	Computable General Equilibrium Model . . . . .	149
4.3.1	Social Accounting Matrix . . . . .	149
4.3.2	Introduction of the CGE Model . . . . .	150
4.3.3	Applications of the CGE Model . . . . .	151
4.4	Intelligent Agent and Simulation . . . . .	153
4.5	Agent-Based Computational Economics . . . . .	156
4.5.1	Introduction of the ACE Model . . . . .	156
4.5.2	Applications of the ACE Model . . . . .	157
	References . . . . .	160
<b>5</b>	<b>Introduction of Intelligent Engineering . . . . .</b>	<b>163</b>
5.1	Introduction . . . . .	163
5.2	Generalized Model . . . . .	166
5.2.1	Mathematical Model . . . . .	167
5.2.2	Rule-Based Model . . . . .	168
5.2.3	Fuzzy Inference Model . . . . .	169
5.2.4	Neural Network Model . . . . .	169
5.2.5	Hybrid Model . . . . .	170
5.3	Intelligent Space . . . . .	171
5.3.1	Concepts . . . . .	171
5.3.2	Problem $B_1$ . . . . .	176
5.3.3	Problem $B_2$ . . . . .	178
	References . . . . .	179
<b>6</b>	<b>Agent Response Equilibrium Model . . . . .</b>	<b>181</b>
6.1	Agent . . . . .	181
6.1.1	Definition . . . . .	181
6.1.2	Classification . . . . .	182
6.1.3	Features . . . . .	183
6.1.4	Self-Learning . . . . .	184
6.2	Multi-agent Model . . . . .	184
6.2.1	Multi-agent System . . . . .	184
6.2.2	Multi-agent Model . . . . .	184
6.3	Introduction to ARE Model . . . . .	185
6.3.1	ARE Model . . . . .	185
6.3.2	ARE Model Framework . . . . .	186
6.3.3	Functions of Agents . . . . .	187
6.3.4	Features of ARE Model . . . . .	189
6.4	Design of ARE Model . . . . .	189
6.4.1	Model Structure . . . . .	189
6.4.2	Interaction Mechanism Assumptions . . . . .	190
6.4.3	Assumptions . . . . .	191
6.4.4	Database Design . . . . .	192
6.4.5	Rule Base Design . . . . .	192
6.4.6	Self-Learning Rules of Agents . . . . .	193

6.4.7	Communication Mechanism . . . . .	194
6.4.8	Energy Consumption Calculation . . . . .	196
	References . . . . .	198
<b>7</b>	<b>Individual Agent Functions and Computer Programming . . . . .</b>	<b>199</b>
7.1	Individual Agent . . . . .	199
7.1.1	Sector Agent . . . . .	199
7.1.2	Market Agent . . . . .	204
7.1.3	International Commodity Market Agent . . . . .	206
7.1.4	Government Agent . . . . .	207
7.1.5	Central Bank Agent . . . . .	208
7.1.6	Commercial Bank Agent . . . . .	209
7.1.7	Resident Agent . . . . .	210
7.2	Computer Program of ARE Model . . . . .	211
7.2.1	The Computer Program Flowchart . . . . .	211
7.2.2	Computer Programming Environment . . . . .	211
7.2.3	Typical Statements of the Computer Program . . . . .	214
7.3	Input Data of ARE Model . . . . .	217
7.3.1	IO Data Input . . . . .	217
7.3.2	Financial Data Input . . . . .	222
7.3.3	Labor Data Input . . . . .	223
7.3.4	Production Function Data Input . . . . .	224
7.3.5	Tax Data Input . . . . .	225
7.4	Parameters . . . . .	228
7.4.1	Elasticity . . . . .	228
7.4.2	Monetary Parameters . . . . .	230
	References . . . . .	230

### **Part III China's Economic Simulations by Agents Response Equilibrium**

<b>8</b>	<b>China's Economic Simulation for the Period of Global Crisis . . .</b>	<b>233</b>
8.1	Evaluation Rules of Economic Simulation by the ARE Model . . . . .	234
8.2	Review of China's Economy in 2007 . . . . .	235
8.3	Economic Simulation for 2008 . . . . .	242
8.3.1	Assumptions . . . . .	242
8.3.2	Results . . . . .	243
8.3.3	Calibrations . . . . .	251
8.4	Economic Simulation for 2009 . . . . .	253
8.4.1	Assumptions . . . . .	253
8.4.2	Results . . . . .	253
8.4.3	Calibrations . . . . .	259

8.5	Economic Simulation for 2010 . . . . .	262
8.5.1	Assumptions . . . . .	262
8.5.2	Results . . . . .	263
8.5.3	Calibrations . . . . .	269
8.6	Update of Input–Output Table . . . . .	272
<b>9</b>	<b>China’s Economic Simulations in 2011–2014 by Agent Response Equilibrium Model . . . . .</b>	<b>275</b>
9.1	Summary of Evaluation Rules on Economic Simulation of ARE Model . . . . .	275
9.2	Economic Simulation for 2011 by ARE Model . . . . .	276
9.2.1	Fiscal and Monetary Policies . . . . .	276
9.2.2	Simulation Results . . . . .	277
9.2.3	Error Analysis . . . . .	284
9.3	Economic Simulation for 2012 by ARE Model . . . . .	285
9.3.1	Fiscal and Monetary Policies . . . . .	285
9.3.2	Simulation Results . . . . .	285
9.3.3	Error Analysis . . . . .	294
9.4	Economic Simulation for 2013 by ARE Model . . . . .	296
9.4.1	Fiscal and Monetary Policies . . . . .	296
9.4.2	Simulation Results . . . . .	296
9.4.3	Error Analysis . . . . .	304
9.5	Economic Simulation for 2014 by ARE Model . . . . .	305
9.5.1	Fiscal and Monetary Policies . . . . .	305
9.5.2	Simulation Results . . . . .	306
9.5.3	Error Analysis . . . . .	314
9.6	Summary and Conclusion . . . . .	315
<b>10</b>	<b>China’s Input–Output Tables of 2011–2025 Simulated by ARE . . . . .</b>	<b>317</b>
10.1	Input–Output Tables of 2011–2014 in China . . . . .	317
10.1.1	Input–Output Tables . . . . .	319
10.1.2	Analysis . . . . .	319
10.2	Input–Output Tables of 2015–2025 (BAU Scenario) . . . . .	345
10.2.1	Input–Output Tables . . . . .	345
10.2.2	Analysis . . . . .	412
10.3	Input–Output Tables of 2015–2025 (Policy Scenario) . . . . .	418
10.3.1	Input–Output Tables . . . . .	418
10.3.2	Analysis . . . . .	486

China's Economic Gene Mutations

By Electricity Economics and Multi-agent

Hu, Z.; Zhang, J.; Zhang, N.

2015, XVIII, 491 p. 285 illus., 277 illus. in color.,

Hardcover

ISBN: 978-3-662-47297-2